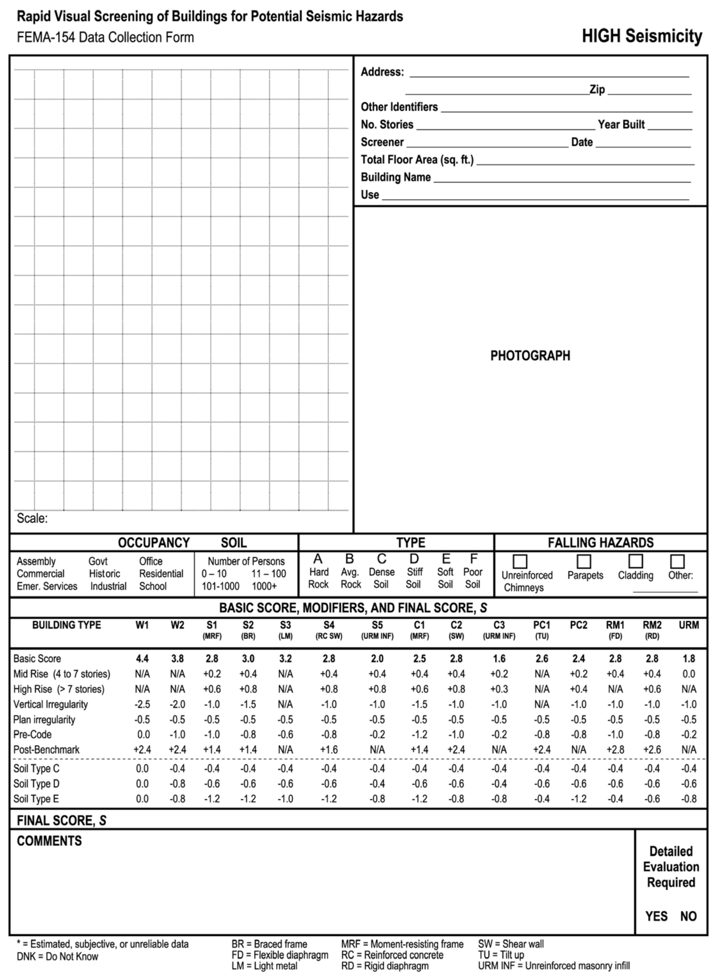
Chapter 3

Completing the Data Collection Form

3.1 Introduction

This chapter provides instructions on how to complete the Data Collection Form (Figure 3-1). It is assumed that the Data Collection Form has already been selected, based on the seismicity level of the area to be screened (as per Chapter 2). The Data Collection Form is completed for each building screened through execution of the following steps:

1. Verifying and updating the building identification information;
2. Walking around the building to identify its size and shape, and sketching a plan and elevation view on the Data Collection Form;
3. Determining and documenting occupancy;
4. Determining soil type, if not identified during the pre-planning process;
5. Identifying potential nonstructural falling hazards, if any, and indicating their existence on the Data Collection Form;
6. Identifying the seismic lateral-load resisting system (entering the building, if possible, to facilitate this process) and circling the related Basic Structural Hazard Score on the Data Collection Form;
7. Identifying and circling the appropriate seismic performance attribute Score Modifiers (e.g., number of stories, design date, and soil type) on the Data Collection Form;
8. Determining the Final Score, *S* (by adjusting the Basic Structural Hazard Score with the Score Modifiers identified in Step 7), and deciding if a detailed evaluation is required; and
9. Photographing the building and attaching the photo to the form (if an instant camera is used), or indicating a photo reference number on the form (if a digital camera is used).



Rapid Visual Screening of Buildings for Potential Seismic Hazards
FEMA-154 Data Collection Form

HIGH Seismicity

Address: ______________________
Zip ______
Other Identifiers ______
No. Stories ______ Year Built ______
Screener ______ Date ______
Total Floor Area (sq. ft.) ______
Building Name ______
Use ______

Scale:

PHOTOGRAPH

OCCUPANCY			SOIL	TYPE						FALLING HAZARDS			
Assembly Commercial Emer. Services	Govt Historic Industrial	Office Residential School	Number of Persons 0 – 10 11 – 100 101-1000 1000+	A Hard Rock	B Avg. Rock	C Dense Soil	D Stiff Soil	E Soft Soil	F Poor Soil	Unreinforced Chimneys	Parapets	Cladding	Other:

BASIC SCORE, MODIFIERS, AND FINAL SCORE, *S*

BUILDING TYPE	W1	W2	S1 (MRF)	S2 (BR)	S3 (LM)	S4 (RC SW)	S5 (URM INF)	C1 (MRF)	C2 (SW)	C3 (URM INF)	PC1 (TU)	PC2	RM1 (FD)	RM2 (RD)	URM
Basic Score	**4.4**	**3.8**	**2.8**	**3.0**	**3.2**	**2.8**	**2.0**	**2.5**	**2.8**	**1.6**	**2.6**	**2.4**	**2.8**	**2.8**	**1.8**
Mid Rise (4 to 7 stories)	N/A	N/A	+0.2	+0.4	N/A	+0.4	+0.4	+0.4	+0.4	+0.2	N/A	+0.2	+0.4	+0.4	0.0
High Rise (> 7 stories)	N/A	N/A	+0.6	+0.8	N/A	+0.8	+0.8	+0.6	+0.8	+0.3	N/A	+0.4	N/A	+0.6	N/A
Vertical Irregularity	-2.5	-2.0	-1.0	-1.5	N/A	-1.0	-1.0	-1.5	-1.0	-1.0	N/A	-1.0	-1.0	-1.0	-1.0
Plan irregularity	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Pre-Code	0.0	-1.0	-1.0	-0.8	-0.6	-0.8	-0.2	-1.2	-1.0	-0.2	-0.8	-0.8	-1.0	-0.8	-0.2
Post-Benchmark	+2.4	+2.4	+1.4	+1.4	N/A	+1.6	N/A	+1.4	+2.4	N/A	+2.4	N/A	+2.8	+2.6	N/A
Soil Type C	0.0	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Soil Type D	0.0	-0.8	-0.6	-0.6	-0.6	-0.6	-0.4	-0.6	-0.6	-0.4	-0.6	-0.6	-0.6	-0.6	-0.6
Soil Type E	0.0	-0.8	-1.2	-1.2	-1.0	-1.2	-0.8	-1.2	-0.8	-0.8	-0.4	-1.2	-0.4	-0.6	-0.8

FINAL SCORE, *S*

COMMENTS

Detailed Evaluation Required
YES NO

* = Estimated, subjective, or unreliable data
DNK = Do Not Know
BR = Braced frame
FD = Flexible diaphragm
LM = Light metal
MRF = Moment-resisting frame
RC = Reinforced concrete
RD = Rigid diaphragm
SW = Shear wall
TU = Tilt up
URM INF = Unreinforced masonry infill

Figure 3-1 Example RVS Data Collection Form (high seismicity).

Full-sized copies of the Data Collection Forms (one for each seismicity region) are provided in Appendix B, along with a Quick Reference Guide defining terms used on the Data Collection Form. The form has been designed to be filled out in a progressive manner, with a minimum of writing (most items simply can be circled).

Following are detailed instructions and guidance for each of the nine steps above.

3.2 Verifying and Updating the Building Identification Information

Space is provided in the upper right-hand portion of the Data Collection Form (see Figure 3-2) to document building identification information (i.e., address, name, number of stories, year built, and other data). As indicated in Chapter 2, it is desirable to develop and document this information during the pre-planning stage, if at all possible. This information may be entered manually, or be printed on a peel-off label.

Proper identification and location of the building is critically important for subsequent use in hazard assessment and mitigation by the RVS authority. As described in Chapter 2, the authority may prefer to identify and file structures by street address, parcel number, building owner, or some other scheme. However, it is recommended that as a minimum the street address and zip code be recorded on the form. Zip code is important because it is universal to all municipalities, is an especially useful item for later collation and summary analyses. Assessor parcel number or lot number is also useful for jurisdictional record-keeping purposes.

Assuming the identification information is provided on a peel-off label, which is then affixed to the form, or preprinted directly on the form, such information should be verified in the field. If the building identification data are not developed during the pre-planning stage, it must be completed in the field. Documentation of the building address information and name, if it exists, is straightforward. Following is guidance and discussion pertaining to number of stories, year built, identification of the screener, and estimation of total floor area.

3.2.1 Number of Stories

The height of a structure is sometimes related to the amount of damage it may sustain. On soft soils, a tall building may experience considerably stronger and longer duration shaking than a shorter building of the same type. The number of stories is a good indicator of the height of a building (approximately 9-to-10 feet per story for residential, 12 feet per story for commercial or office).

Counting the number of stories may not be a straightforward issue if the building is constructed on a hill or if it has several different roof levels. As a general rule, use the largest number (that is,

Address: ______________________________
______________________________ Zip ______________
Other Identifiers ______________________________
No. Stories ______________________________ Year Built ________
Screener ______________________________ Date ______________
Total Floor Area (sq. ft.) ______________________________
Building Name ______________________________
Use ______________________________

Figure 3-2 Portion of Data Collection Form for documenting building identification.

count floors from the downhill side to the roof). In addition, the number of stories may not be unique. A building may be stepped or have a tower. Use the comment section and the sketch to indicate variations in the number of stories.

3.2.2 Year Built

This information is one of the key elements of the RVS procedure. Building age is tied directly to design and construction practices. Therefore, age can be a factor in determining building type and thus can affect the final scores. This information is not typically available at the site and thus should be included in pre-field data collection.

There may be no single "year built." Certain portions of the structure may have been designed and constructed before others. If this should be the case, the construction dates for each portion can be indicated in the comment section or on the sketch (see Section 3.3). Caution should also be used when interpreting design practices from date of construction. The building may have been designed several years before it was constructed and thus designed to an earlier code with different requirements for seismic detailing.

If information on "year built" is not available during the RVS pre-field data acquisition stage (see Section 2.6), a rough estimate of age will be made on the basis of architectural style and building use. This is discussed in more detail in Appendix D, which provides additional guidance on determining building attributes from streetside. If the year built is only an approximation, an asterisk is used to indicate the entry is estimated.

3.2.3 Screener Identification

The screener should be identified, by name, initials, or some other type of code. At some later time it may be important to know who the screener was for a particular building, so this information should not be omitted.

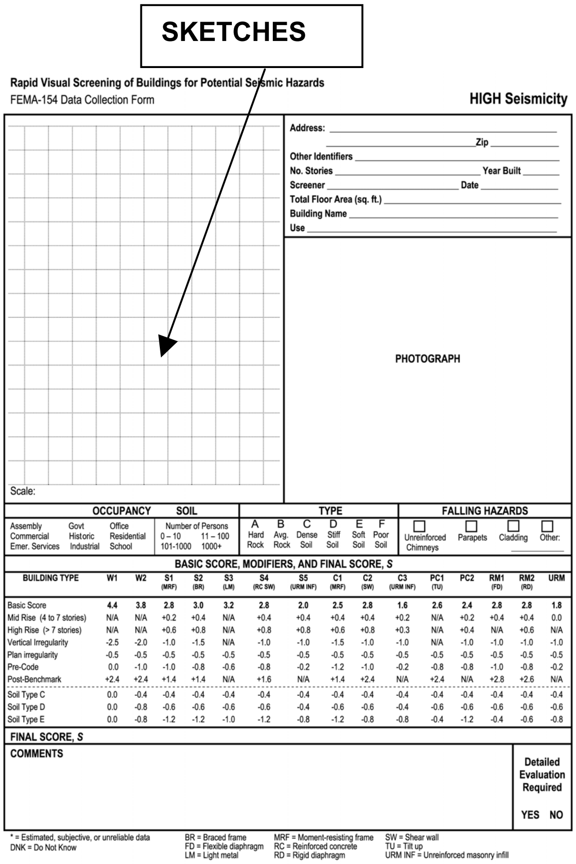


Figure 3-3 Sample Data Collection Form showing location for sketches of building plan and elevation views.

3.2.4 *Total Floor Area*

The total floor area, in some cases available from building department or assessor files (see Section 2.6), will most likely be estimated by multiplying the estimated area of one story by the total number of stories in the building. The length and width of the building can be paced off or estimated (during the planning stage) from Sanborn or other parcel maps. Total floor area is useful for estimating occupancy load (see Section 3.5.2) and may be useful at a later time for estimating the value of the building. Indicate with an asterisk when total floor area is estimated.

3.3 Sketching the Plan and Elevation Views

As a minimum, a sketch of the plan of the building should be drawn on the Data Collection Form (see Figure 3-3). An elevation may also be useful in indicating significant features. The sketches are especially important, as they reveal many of the building's attributes to the screener as the sketch is made. In other words, it forces the screener to systematically view all aspects of the building. The plan sketch should include the location of the building on the site and distance to adjacent buildings. One suggestion is to make the plan sketch from a Sanborn map as part of pre-field work (see Chapter 2), and then verify it in the field. This is especially valuable when access between buildings is not available. If all sides of the building are different, an elevation should be sketched for each side. Otherwise indicate that the sketch is typical of all sides. The sketch should note and emphasize special features such as existing significant cracks or configuration problems.

Dimensions should be included. As indicated in the previous section, the length and width of the building can be paced off or estimated (during the planning stage) from Sanborn or other parcel maps.

3.4 Determining Soil Type

As indicated in Section 2.6.6, soil type should be identified and documented on the Data Collection Form (see Figure 3-4) during the pre-field soils data acquisition and review phase. If soil type has not been determined as part of that process, it needs to be identified by the screener during the

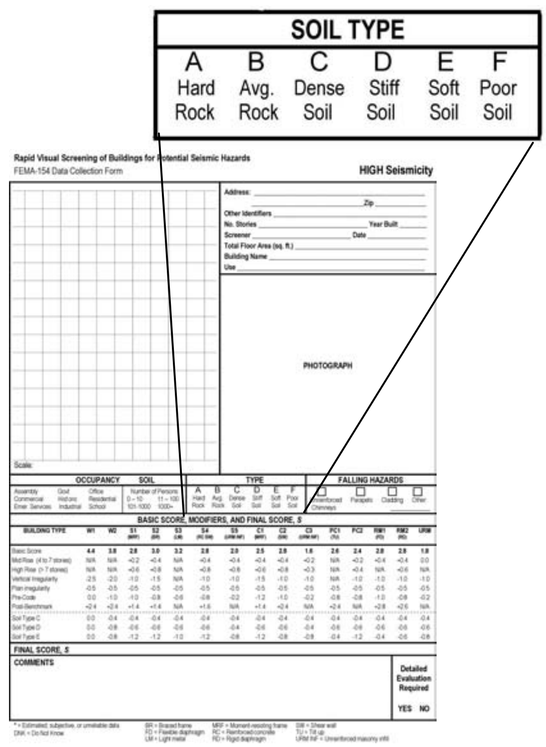


Figure 3-4 Location on Data Collection Form where soil type information is documented (circled).

building site visit. If there is no basis for classifying the soil type, a soil type E should be assumed. However, for one-story or two-story buildings with a roof height equal to or less than 25 feet, a class D soil type may be assumed when site conditions are not known.

3.5 Determining and Documenting Occupancy

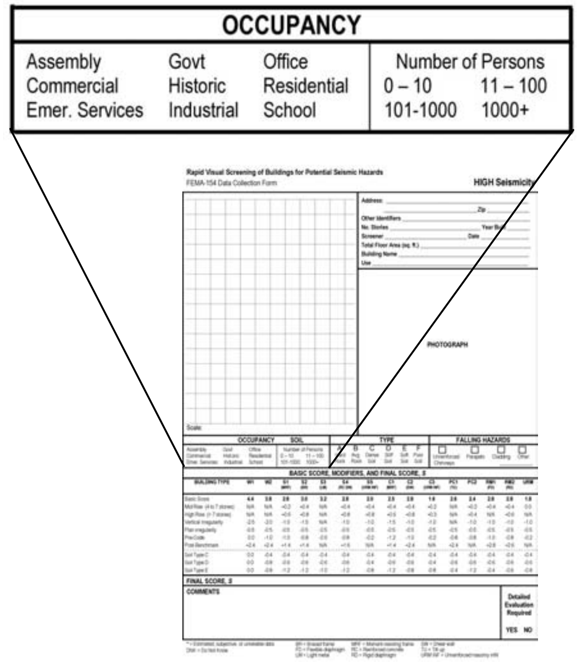
Two sets of information are needed relative to occupancy: (1) building use, and (2) estimated number of persons occupying the building.

3.5.1 Occupancy

Occupancy-related information is indicated by circling the appropriate information in the left-center portion of the form (see Figure 3-5). The occupancy of a building refers to its use, whereas the occupancy load is the number of people in the building (see Section 3.5.2). Although usually not bearing directly on the structural hazard or probability of sustaining major damage, the occupancy of a building is of interest and use when determining priorities for mitigation.

Nine general occupancy classes that are easy to recognize have been defined. They are listed on the form as Assembly, Commercial, Emergency Services (Emer. Services), Government (Govt), Historic, Industrial, Office, Residential, School buildings. These are the same classes used in the first edition of FEMA 154. They have been retained in this edition for consistency, they are easily identifiable from the street, they generally represent the broad spectrum of building uses in the United States, and they are similar to the occupancy categories in the *Uniform Building Code* (ICBO, 1997).

The occupancy class that best describes the building being evaluated should be circled on the form. If there are several types of uses in the building, such as commercial and residential, both should be circled. The actual use of the building may be written in the upper right hand portion of the form. For example, one might indicate that the building is a post office or a library on the line titled "use" in the upper right of the form (see Figure 3-2). In both of these cases, one would also circle "Govt". If none of the defined classes seem to fit the building, indicate the use in the upper right portion of the form (the building identification area) or include an explanation in the comments section. The nine occupancy classes are described below (with general indications of occupancy load):



- *Assembly.* Places of public assembly are those where 300 or more people might be gathered in one room at the same time. Examples are theaters, auditoriums, community centers, performance halls, and churches. (Occupancy load varies greatly and can be as much as 1 person per 10 sq. ft. of floor area, depending primarily on the condition of the seating—fixed versus moveable).
- *Commercial.* The commercial occupancy class refers to retail and wholesale businesses, financial institutions, restaurants, parking structures and light warehouses. (Occupancy load varies; use 1 person per 50 to 200 sq. ft.).
- *Emergency Services.* The emergency services class is defined as any facility that would likely be needed in a major catastrophe. These include police and fire stations, hospitals, and communications centers. (Occupancy load is typically 1 person per 100 sq. ft.).
- *Government.* This class includes local, state and federal non-emergency related buildings (Occupancy load varies; use 1 person per 100 to 200 sq. ft.).
- *Historic.* This class will vary from community to community. It is included because historic buildings may be subjected to specific ordinances and codes.

- *Industrial.* Included in the industrial occupancy class are factories, assembly plants, large warehouses and heavy manufacturing facilities. (Typically, use 1 person per 200 sq. ft. except warehouses, which are perhaps 1 person per 500 sq. ft.).
- *Office.* Typical office buildings house clerical and management occupancies (use 1 person per 100 to 200 sq. ft.).
- *Residential.* This occupancy class refers to residential buildings such as houses, townhouses, dormitories, motels, hotels, apartments and condominiums, and residences for the aged or disabled. (The number of persons for residential occupancies varies from about 1 person per 300 sq. ft. of floor area in dwellings, to perhaps 1 person per 200 sq. ft. in hotels and apartments, to 1 per 100 sq. ft. in dormitories).
- *School.* This occupancy class includes all public and private educational facilities from nursery school to university level. (Occupancy load varies; use 1 person per 50 to 100 sq. ft.).

When occupancy is used by a community as a basis for setting priorities for hazard mitigation purposes, the upgrade of emergency services buildings is often of highest priority. Some communities may have special design criteria governing buildings for emergency services. This information may be used to add a special Score Modifier to increase the score for specially designed emergency buildings.

3.5.2 Occupancy Load

Like the occupancy class or use of the building, the occupancy load may be used by an RVS authority in setting priorities for hazard mitigation plans. The community may wish to upgrade buildings with more occupants first. As can be seen from the form (Figure 3-5), the occupancy load is defined in ranges such as 1-10, 11-100, 101-1000, and 1000+ occupants. The range that best describes the average occupancy of the building is circled. For example, if an office building appears to have a daytime occupancy of 200 persons, and an occupancy of only one or two persons otherwise, the maximum occupancy load is 101-1000 persons. If the occupancy load is estimated from building size and use, an inserted asterisk will automatically indicate that these are approximate data.

3.6 Identifying Potential Nonstructural Falling Hazards

Nonstructural falling hazards such as chimneys, parapets, cornices, veneers, overhangs and heavy cladding can pose life-safety hazards if not adequately anchored to the building. Although these hazards may be present, the basic lateral-load system for the building may be adequate and require no further review. A series of four boxes have been included to indicate the presence of nonstructural falling hazards (see Figure 3-6). The falling hazards of major concern are:

- *Unreinforced Chimneys.* Unreinforced masonry chimneys are common in older masonry and wood-frame dwellings. They are often inadequately tied to the house and fall when strongly shaken. If in doubt as to whether a chimney is reinforced or unreinforced, assume it is unreinforced.
- *Parapets*. Unbraced parapets are difficult to identify from the street as it is sometimes difficult to tell if a facade projects above the roofline. Parapets often exist on three sides of the building, and their height may be visible from the back of the structure.
- *Heavy Cladding*. Large heavy cladding elements, usually precast concrete or cut

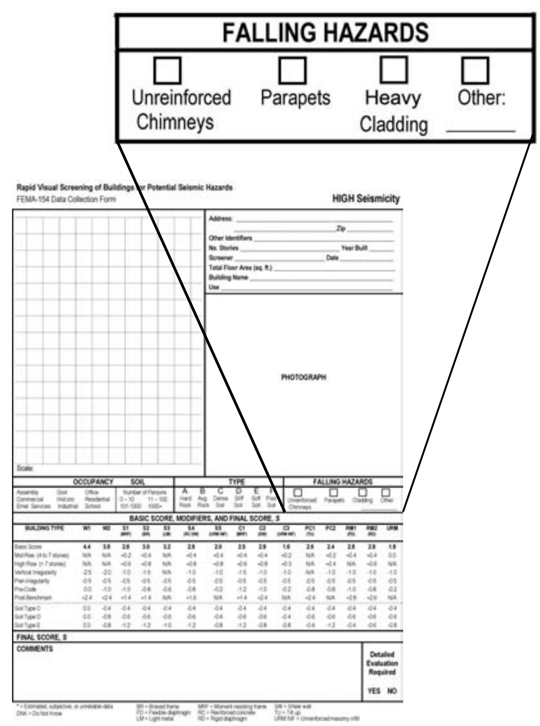


Figure 3-6 Portion of Data Collection Form for documenting nonstructural falling hazards.

stone, may fall off the building during an earthquake if improperly anchored. The loss of panels may also create major changes to the building stiffness (the elements are considered nonstructural but often contribute substantial stiffness to a building), thus setting up plan irregularities or torsion when only some fall. (Glass curtain walls are not considered as heavy cladding in the RVS procedure.) The existence of heavy cladding is of concern if the connections were designed and installed before the jurisdiction adopted seismic anchorage requirements (normally twice that for gravity loads). The date of such code adoption will vary with jurisdiction and should be established by an experienced design professional in the planning stages of the RVS process (see Section 2.4.2).

If any of the above nonstructural falling hazards exist, the appropriate box should be checked. If there are any other falling hazards, the "Other" box should be checked, and the type of hazard indicated on the line beneath this box. Use the comments section if additional space is required.

The RVS authority may later use this information as a basis for notifying the owner of potential problems.

3.7 Identifying the Lateral-Load-Resisting System and Documenting the Related Basic Structural Score

The RVS procedure is based on the premise that the screener will be able to determine the building's lateral-load-resisting system from the street, or to eliminate all those that it cannot possibly be. It is further assumed that the lateral-load-resisting system is one of fifteen types that have been observed to be prevalent, based on studies of building stock in the United States. The fifteen types are consistent with the model building types identified in the FEMA 310 Report and the predecessor documents that have addressed seismic evaluation of buildings (e.g., ATC, 1987; BSSC, 1992)). The fifteen model building types used in this document, however, are an abbreviated subset of the 22 types now considered standard by FEMA; excluded from the FEMA 154 list are sub-classifications of certain framing types that specify that the roof and floor diaphragms are either rigid or flexible.

3.7.1 Fifteen Building Types Considered by the RVS Procedure and Related Basic Structural Scores

Following are the fifteen building types used in the RVS procedure. Alpha-numeric reference codes used on the Data Collection Form are shown in parentheses.

1. Light wood-frame residential and commercial buildings smaller than or equal to 5,000 square feet (W1)
2. Light wood-frame buildings larger than 5,000 square feet (W2)
3. Steel moment-resisting frame buildings (S1)
4. Braced steel frame buildings (S2)
5. Light metal buildings (S3)
6. Steel frame buildings with cast-in-place concrete shear walls (S4)
7. Steel frame buildings with unreinforced masonry infill walls (S5)
8. Concrete moment-resisting frame buildings (C1)
9. Concrete shear-wall buildings (C2)
10. Concrete frame buildings with unreinforced masonry infill walls (C3)
11. Tilt-up buildings (PC1)
12. Precast concrete frame buildings (PC2)
13. Reinforced masonry buildings with flexible floor and roof diaphragms (RM1)
14. Reinforced masonry buildings with rigid floor and roof diaphragms (RM2)
15. Unreinforced masonry bearing-wall buildings (URM)

For each of these fifteen model building types, a Basic Structural Hazard Score has been computed that reflects the estimated likelihood that building collapse will occur if the building is subjected to the maximum considered earthquake ground motions for the region. The Basic Structural Hazard Scores are based on the damage and loss estimation functions provided in the FEMA-funded HAZUS damage and loss estimation methodology (NIBS, 1999). For more information about the development of the Basic Structural Hazard Scores, see the companion FEMA 155 report (ATC, 2002).

The Basic Structural Scores are provided on each Data Collection Form in the first row of the

BASIC SCORE, MODIFIERS, AND FINAL SCORE, *S*																
BUILDING TYPE	W1	W2	S1 (MRF)	S2 (BR)	S3 (LM)	S4 (RC SW)	S5 (URM INF)	C1 (MRF)	C2 (SW)	C3 (URM INF)	PC1 (TU)	PC2	RM1 (FD)	RM2 (RD)	URM
Basic Score	4.4	3.8	2.8	3.0	3.2	2.8	2.0	2.5	2.8	1.6	2.6	2.4	2.8	2.8	1.8

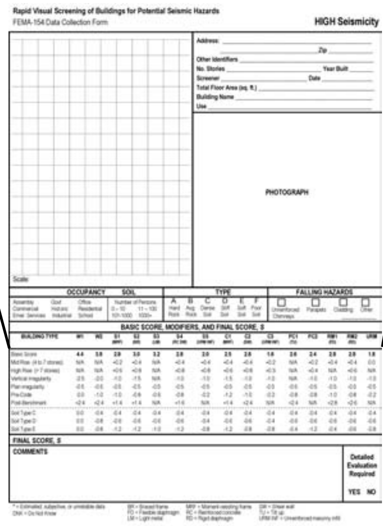

Rapid Visual Screening of Buildings for Potential Seismic Hazards
FEMA-154 Data Collection Form
HIGH Seismicity
PHOTOGRAPH
BASIC SCORE, MODIFIERS, AND FINAL SCORE, S
FINAL SCORE, S
COMMENTS
Detailed Evaluation Required
YES NO

Figure 3-7. Portion of Data Collection Form containing Basic Structural Hazard Scores.

structural scoring matrix in the lower portion of the Data Collection Form (see Figure 3-7). In high and moderate seismicity regions, these scores apply to buildings built after the initial adoption and enforcement of seismic codes, but before the relatively recent significant improvement of codes (that is, before the applicable benchmark year, as defined in Table 2-2). In low seismicity regions, they apply to all buildings except those designed and constructed after the applicable benchmark year, as defined in Table 2-2.

A key issue to be addressed in the planning stage (as recommended in Section 2.4.2) is the identification of those years in which seismic codes were initially adopted and later significantly improved. If the RVS authority in high and moderate seismicity regions is unsure of the year(s) in which codes were initially adopted, the default year for all but PC1 (tiltup) buildings is 1941, (the default year specified in the HAZUS criteria, NIBS, 1999). For PC1 (tiltup) buildings, the initial year in which effective seismic codes were specified is 1973 (ICBO, 1973). As described in Sections 3.8.5 and 3.8.6, the Data Collection Form includes Score Modifiers that provide a means for modifying the Basic Structural Hazard Score as a function of design and construction date.

Brief summaries of the physical characteristics and expected earthquake performance of each of the fifteen model building types, along with a photograph of a sample exterior view, and the Basic Structural Scores for regions of low (L), moderate (M), and high (H) seismicity are provided in Table 3-1.

Additional background information on the physical characteristics and earthquake performance of these building types, not essential to the RVS procedure, is provided in Appendix E.

3.7.2 Identifying the Lateral-Force-Resisting System

At the heart of the RVS procedure is the task of identifying the lateral-force-resisting system from the street. Once the lateral-force-resisting system is identified, the screener finds the appropriate alpha-numeric code on the Data Collection Form and circles the Basic Structural Hazard Score immediately beneath it (see Figure 3-7).

Ideally, the lateral-force-resisting system for each building to be screened would be identified prior to field work through the review and interpretation of construction documents for each building (i.e., during the planning stage, as discussed in Section 2.7).

If prior determination of the lateral-force-resisting system is not possible through the review of building plans, which is the most likely scenario, this determination must be made in the field. In this case, the screener reviews spacing and size of windows, and the apparent construction materials to determine the lateral-force resisting system. If the screener cannot identify with complete assuredness the lateral-force-resisting system from the street, the screener should enter the building interior to verify the building type selected (see Section 3.7.3 for additional information on this issue.)

If the screener cannot determine the lateral-force-resisting system, and access to the interior is not possible, the screener should eliminate those lateral-force-resisting systems that are not possible and assume that any of the others are possible. In this case the Basic Structural Hazard Scores for all possible lateral-force-resisting systems would be circled on the Data Collection Form. More guidance and options pertaining to this issue are provided in Section 3.9.

Table 3-1 Build Type Descriptions, Basic Structural Hazard Scores, and Performance in Past Earthquakes

Building Identifier	*Photograph*	*Basic Structural Hazard Score*	*Characteristics and Performance*
W1 Light wood frame residential and commercial buildings equal to or smaller than 5,000 square feet		H = 2.8 M = 5.2 L = 7.4	• Wood stud walls are typically constructed of 2-inch by 4-inch vertical wood members set about 16 inches apart (2-inch by 6-inch for multiple stories). • Most common exterior finish materials are wood siding, metal siding, or stucco. • Buildings of this type performed very well in past earthquakes due to inherent qualities of the structural system and because they are lightweight and low rise. • Earthquake-induced cracks in the plaster and stucco (if any) may appear, but are classified as non-structural damage. • The most common type of structural damage in older buildings results from a lack of connection between the superstructure and the foundation, and inadequate chimney support.
W2 Light wood frame buildings greater than 5,000 square feet		H = 3.8 M =4.8 L = 6.0	• These are large apartment buildings, commercial buildings or industrial structures usually of one to three stories, and, rarely, as tall as six stories.

Table 3-1 Build Type Descriptions, Basic Structural Hazard Scores, and Performance in Past Earthquakes (Continued)

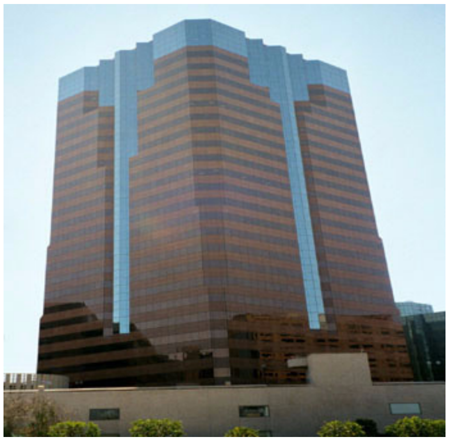
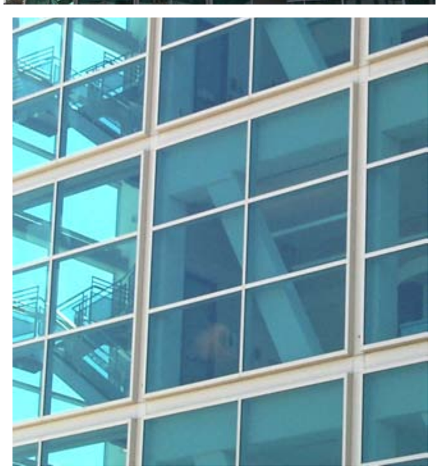
Building Identifier	*Photograph*	*Basic Structural Hazard Score*	*Characteristics and Performance*
S1 Steel moment-resisting frame		H = 2.8 M = 3.6 L = 4.6	• Typical steel moment-resisting frame structures usually have similar bay widths in both the transverse and longitudinal directions, around 20-30 ft. • The floor diaphragms are usually concrete, sometimes over steel decking. This structural type is used for commercial, institutional and public buildings. • The 1994 Northridge and 1995 Kobe earthquakes showed that the welds in steel moment- frame buildings were vulnerable to severe damage. The damage took the form of broken connections between the beams and columns.
S2 Braced steel frame	  Zoom-in of upper photo	H = 3.0 M = 3.6 L = 4.8	• These buildings are braced with diagonal members, which usually cannot be detected from the building exterior. • Braced frames are sometimes used for long and narrow buildings because of their stiffness. • From the building exterior, it is difficult to tell the difference between steel moment frames, steel braced frames, and steel frames with interior concrete shear walls. • In recent earthquakes, braced frames were found to have damage to brace connections, especially at the lower levels.

Table 3-1 Build Type Descriptions, Basic Structural Hazard Scores, and Performance in Past Earthquakes (Continued)

Building Identifier	*Photograph*	*Basic Structural Hazard Score*	*Characteristics and Performance*
S3 Light metal building		H = 3.2 M = 3.8 L = 4.6	• The structural system usually consists of moment frames in the transverse direction and braced frames in the longitudinal direction, with corrugated sheet-metal siding. In some regions, light metal buildings may have partial-height masonry walls. • The interiors of most of these buildings do not have interior finishes and their structural skeleton can be seen easily. • Insufficient capacity of tension braces can lead to their elongation and consequent building damage during earthquakes. • Inadequate connection to a slab foundation can allow the building columns to slide on the slab. • Loss of the cladding can occur.
S4 Steel frames with cast-in-place concrete shear walls		H = 2.8 M = 3.6 L = 4.8	• Lateral loads are resisted by shear walls, which usually surround elevator cores and stairwells, and are covered by finish materials. • An interior investigation will permit a wall thickness check. More than six inches in thickness usually indicates a concrete wall. • Shear cracking and distress can occur around openings in concrete shear walls during earthquakes. • Wall construction joints can be weak planes, resulting in wall shear failure below expected capacity.

Table 3-1 Build Type Descriptions, Basic Structural Hazard Scores, and Performance in Past Earthquakes (Continued)

Building Identifier	*Photograph*	*Basic Structural Hazard Score*	*Characteristics and Performance*
S5 Steel frames with unreinforced masonry infill walls		H = 2.0 M = 3.6 L = 5.0	• Steel columns are relatively thin and may be hidden in walls. • Usually masonry is exposed on exterior with narrow piers (less than 4 ft wide) between windows. • Portions of solid walls will align vertically. • Infill walls are usually two to three wythes thick. • Veneer masonry around columns or beams is usually poorly anchored and detaches easily.
C1 Concrete moment-resisting frames		H = 2.5 M = 3.0 L = 4.4	• All exposed concrete frames are reinforced concrete (not steel frames encased in concrete). • A fundamental factor governing the performance of concrete moment-resisting frames is the level of ductile detailing. • Large spacing of ties in columns can lead to a lack of concrete confinement and shear failure. • Lack of continuous beam reinforcement can result in hinge formation during load reversal. • The relatively low stiffness of the frame can lead to substantial nonstructural damage. • Column damage due to pounding with adjacent buildings can occur.

Table 3-1 Build Type Descriptions, Basic Structural Hazard Scores, and Performance in Past Earthquakes (Continued)

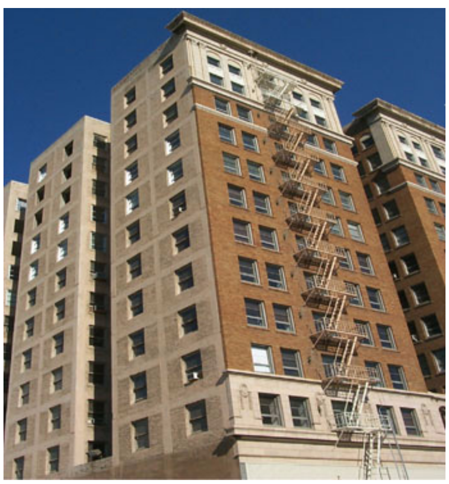
Building Identifier	*Photograph*	*Basic Structural Hazard Score*	*Characteristics and Performance*
C2 Concrete shear wall buildings		H = 2.8 M = 3.6 L = 4.8	• Concrete shear-wall buildings are usually cast in place, and show typical signs of cast-in-place concrete. • Shear-wall thickness ranges from 6 to 10 inches. • These buildings generally perform better than concrete frame buildings. • They are heavier than steel-frame buildings but more rigid due to the shear walls. • Damage commonly observed in taller buildings is caused by vertical discontinuities, pounding, and irregular configuration.
C3 Concrete frames with unreinforced masonry infill walls		H =1.6 M = 3.2 L = 4.4	• Concrete columns and beams may be full wall thickness and may be exposed for viewing on the sides and rear of the building. • Usually masonry is exposed on the exterior with narrow piers (less than 4 ft wide) between windows. • Portions of solid walls will align vertically. • This type of construction was generally built before 1940 in high-seismicity regions but continues to be built in other regions. • Infill walls tend to buckle and fall out-of-plane when subjected to strong lateral out-of-plane forces. • Veneer masonry around columns or beams is usually poorly anchored and detaches easily.

Table 3-1 Build Type Descriptions, Basic Structural Hazard Scores, and Performance in Past Earthquakes (Continued)

Building Identifier	*Photograph*	*Basic Structural Hazard Score*	*Characteristics and Performance*
PC1 Tilt-up buildings	  Partial roof collapse due to failed diaphragm-to-wall connection	H = 2.6 M = 3.2 L = 4.4	• Tilt-ups are typically one or two stories high and are basically rectangular in plan. • Exterior walls were traditionally formed and cast on the ground adjacent to their final position, and then “tilted-up” and attached to the floor slab. • The roof can be a plywood diaphragm carried on wood purlins and glulam beams or a light steel deck and joist system, supported in the interior of the building on steel pipe columns. • Weak diaphragm-to-wall anchorage results in the wall panels falling and the collapse of the supported diaphragm (or roof).

Table 3-1 Build Type Descriptions, Basic Structural Hazard Scores, and Performance in Past Earthquakes (Continued)

Building Identifier	*Photograph*	*Basic Structural Hazard Score*	*Characteristics and Performance*
PC2 Precast concrete frame buildings	 Building under construction  Detail of the precast components  Building nearing completion	H = 2.4 M = 3.2 L = 4.6	• Precast concrete frames are, in essence, post and beam construction in concrete. • Structures often employ concrete or reinforced masonry (brick or block) shear walls. • The performance varies widely and is sometimes poor. • They experience the same types of damage as shear wall buildings (C2). • Poorly designed connections between prefabricated elements can fail. • Loss of vertical support can occur due to inadequate bearing area and insufficient connection between floor elements and columns. • Corrosion of metal connectors between prefabricated elements can occur.

Table 3-1 Build Type Descriptions, Basic Structural Hazard Scores, and Performance in Past Earthquakes (Continued)

Building Identifier	*Photograph*	*Basic Structural Hazard Score*	*Characteristics and Performance*
RM1 Reinforced masonry buildings with flexible diaphragms	  Truss-joists support plywood and lightweight concrete slab  Detail showing reinforced masonry	H = 2.8 M = 3.6 L = 4.8	• Walls are either brick or concrete block. • Wall thickness is usually 8 inches to 12 inches. • Interior inspection is required to determine if diaphragms are flexible or rigid. • The most common floor and roof systems are wood, light steel, or precast concrete. • These buildings can perform well in moderate earthquakes if they are adequately reinforced and grouted, with sufficient diaphragm anchorage. • Poor construction practice can result in ungrouted and unreinforced walls, which will fail easily.

Table 3-1 Build Type Descriptions, Basic Structural Hazard Scores, and Performance in Past Earthquakes (Continued)

Building Identifier	*Photograph*	*Basic Structural Hazard Score*	*Characteristics and Performance*
RM2 Reinforced masonry buildings with rigid dia-phrams		H = 2.8 M = 3.4 L = 4.6	• Walls are either brick or concrete block. • Wall thickness is usually 8 inches to 12 inches. • Interior inspection is required to determine if diaphragms are flexible or rigid. • The most common floor and roof systems are wood, light steel, or precast concrete. • These buildings can perform well in moderate earthquakes if they are adequately reinforced and grouted, with sufficient diaphragm anchorage. • Poor construction practice can result in ungrouted and unreinforced walls, which will fail easily.
URM Unreinforced masonry buildings		H = 1.8 M = 3.4 L = 4.6	• These buildings often used weak lime mortar to bond the masonry units together. • Arches are often an architectural characteristic of older brick bearing wall buildings. • Other methods of spanning are also used, including steel and stone lintels. • Unreinforced masonry usually shows header bricks in the wall surface. • The performance of this type of construction is poor due to lack of anchorage of walls to floors and roof, soft mortar, and narrow piers between window openings.

Determining the lateral-force-resisting system in the field is often difficult. A useful first step is to determine if the building structure is a frame or a bearing wall. Examples of frame structures and bearing wall structures are shown in Figure 3-8, 3-9, and 3-10.

Information to assist the screener in distinguishing if the building is a bearing wall or frame structure is provided in the side bar. Once this determination has been made and the

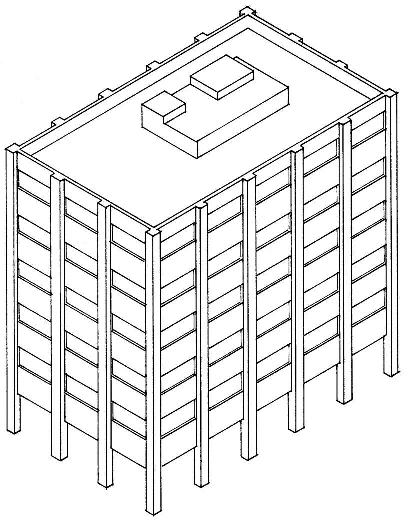


Figure 3-8 Typical frame structure. Features include: large window spans, window openings on many sides, and clearly visible column-beam grid pattern.

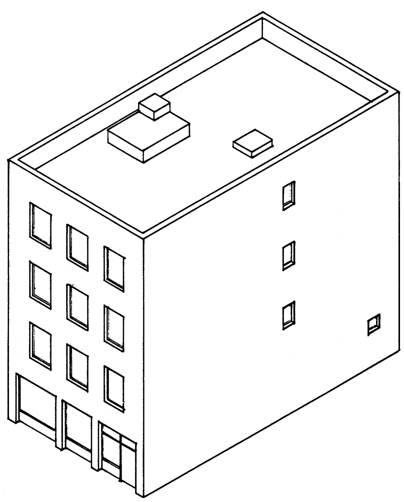


Figure 3-9 Typical bearing wall structure. Features include small window span, at least two mostly solid walls, and thick load-bearing walls.

Distinguishing Between Frame and Bearing Wall Building Systems.

A frame structure (for example, S1, S2, S3, S4, C1, PC2) is made up of beams and columns throughout the entire structure, resisting both vertical and lateral loads. A bearing wall structure (for example, PC1 and URM) uses vertical-load-bearing walls, which are more or less solid, to resist the vertical and lateral loads.

When a building has large openings on all sides, it is probably a frame structure as opposed to a bearing wall structure. A common characteristic of a frame structure is the rectangular grid patterns of the facade, indicating the location of the columns and girders behind the finish material. This is particularly revealing when windows occupy the entire opening in the frame, and no infill wall is used. A newer multistory commercial building should be assumed to be a frame structure, even though there may exist interior shear walls carrying the lateral loads (this would be a frame structure with shear walls).

Bearing wall systems carry vertical and lateral loads with walls rather than solely with columns. Structural floor members such as slabs, joists, and beams, are supported by load-bearing walls. A bearing wall system is thus characterized by more or less solid walls and, as a rule of thumb, a load-bearing wall will have more solid areas than openings. It also will have no wide openings, unless a structural lintel is used.

Some bearing-wall structures incorporate structural columns, or are partly frame structures. This is especially popular in multistory commercial buildings in urban lots where girders and columns are used in the ground floor of a bearing wall structure to provide larger openings for retail spaces. Another example is where the loads are carried by both interior columns and a perimeter wall. Both of these examples should be considered as bearing wall structures, because lateral loads are resisted by the bearing walls. Bearing wall structures sometimes utilize only two walls for load bearing. The other walls are non-load-bearing and thus may have large openings. Therefore, the openness of the front elevation should not be used to determine the structure type. The screener should also look at the side and rear facades. If at least two of the four exterior walls appear to be solid then it is likely that it is a bearing wall structure.

Window openings in older frame structures can sometimes be misleading. Since wide windows were excessively costly and fragile until relatively recently, several narrow windows separated by thin mullions are often seen in older buildings. These thin mullions are usually not load bearing. When the narrow windows are close together, they constitute a large opening typical of a frame structure, or a window in a bearing wall structure with steel lintels.

Whereas open facades on all sides clearly indicate a frame structure, solid walls may be indicative of a bearing wall structure or a frame structure with solid infill walls. Bearing walls are usually much thicker than infill walls, and increase in thickness in the lower stories of multi-story buildings. This increase in wall thickness can be detected by comparing the wall thickness at windows on different floors. Thus, solid walls can be identified as bearing or non-bearing walls according to their thickness, if the structural material is known.

A bearing wall system is sometimes called a box system.

Example of a Frame Building

Example of a Bearing Wall Structure

Figure 3-10 Frame and bearing wall structures

principal structural material is identified, the essential information for determining the lateral-force-resisting system has been established. It is then useful to know that:

- unreinforced masonry and tilt-up buildings are usually bearing-wall type,
- steel buildings and pre-cast concrete buildings are usually frame type, and
- concrete and reinforced masonry buildings may be either type.

A careful review of Table 3-1 and the information provided in Appendices D and E, along with training by knowledgeable building design professionals, should assist the screener in the determination of lateral-force-resisting systems. There will be some buildings for which the lateral-force-resisting system cannot be identified because of their facade treatment. In this case, the screener should eliminate those lateral-force-resisting systems that are not possible and assume that any of the others are possible.

3.7.3 Interior Inspections

Ideally, whenever possible, the screener should seek access to the interior of the building to identify, or verify, the lateral-force-resisting system for the building. In the case of reinforced masonry buildings, entry is particularly important so that the screener can distinguish between RM1 buildings, which have flexible floor and roof diaphragms, and RM2 buildings, which have rigid floor and roof diaphragms.

As with the exterior inspection, the interior process should be performed in a logical manner, either from the basement to the roof, or roof to basement. The screener should look at each floor thoroughly.

The RVS procedure does not require the removal of finish materials that are otherwise permanently affixed to the structure. There are a number of places within a building where it is possible to see the exposed structure. The following are some ways to determine the structure type.

1. If the building has a basement that is not occupied, the first-floor framing may be exposed. The framing will usually be representative of the floor framing throughout the building.
2. If the structural system is a steel or concrete frame, the columns and beams will often be exposed in the basement. The basement walls will likely be concrete, but this does not mean that they are concrete all the way to the roof.
3. High and mid-rise structures usually have one or more levels of parking below the building. When fireproofed steel columns and girders are seen, the screener can be fairly certain that the structure is a steel building (S1, S2, or S4 see Figure 3-11).
4. If the columns and beams are constructed of concrete, the structure type is most likely a concrete moment-frame building (C1, see Figure 3-12). However, this is not guaranteed as some buildings will use steel framing above the ground floor. To ascertain the building type, the screener will need to look at the columns above the first floor.
5. If there is no basement, the mechanical equipment rooms may show what the framing is for the floor above.

Figure 3-11 Interior view showing fire-proofed columns and beams, which indicate a steel building (S1, S2, or S4).

6. If suspended ceilings are used, one of the ceiling tiles can be lifted and simply pushed back. In many cases, the floor framing will then be exposed. Caution should be used in identifying the framing materials, because prior to about 1960, steel beams were encased in concrete to provide fireproofing. If steel framing is seen with what appears to be concrete beams, most likely these are steel beams encased in concrete.
7. If plastered ceilings are observed above suspended ceilings, the screener will not be able to identify the framing materials; however, post-1960 buildings can be eliminated as a possibility because these buildings do not use plaster for ceilings.
8. At the exterior walls, if the structural system is a frame system, there will be regularly spaced furred out places. These are the building columns. If the exterior walls between the columns are constructed of brick masonry and the thickness of the wall is 9 inches or more, the structure type is either steel frame with unreinforced masonry infill (S5) or concrete frame with unreinforced masonry infill (C3).
9. Pre-1930 brick masonry buildings that are six stories or less in height and that have wood-floor framing supported on masonry ledges in pockets formed in the wall are unreinforced masonry bearing-wall buildings (URM).

3.7.4 Screening Buildings with More Than One Lateral-Force-Resisting System

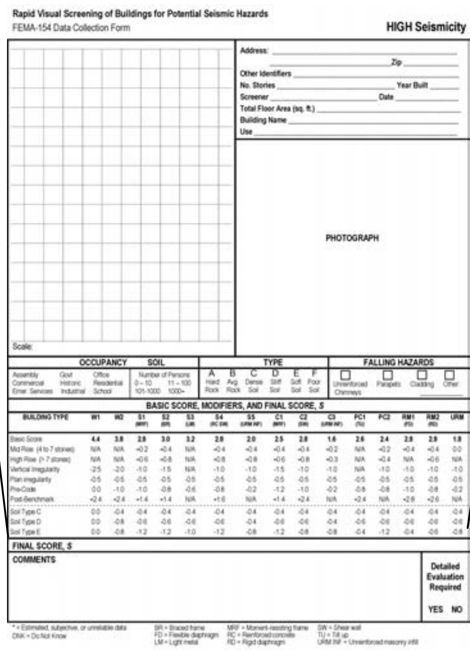
In some cases, the screener may observe buildings having more than one lateral-force-resisting system. Examples might include a wood-frame building atop a precast concrete parking garage, or a building with reinforced concrete shear walls in one direction and a reinforced moment-resisting frame in the other.

Buildings that incorporate more than one lateral-force-resisting system should be evaluated for all observed types of structural systems, and the lowest Final Structural Score, *S*, should govern.

Figure 3-12 Interior view showing concrete columns and girders, which indicate a concrete moment frame (C1).

Score Modifier

BASIC SCORE, MODIFIERS, AND FINAL SCORE, *S*															
BUILDING TYPE	W1	W2	S1 (MRF)	S2 (BR)	S3 (LM)	S4 (RC SW)	S5 (URM INF)	C1 (MRF)	C2 (SW)	C3 (URM INF)	PC1 (TU)	PC2	RM1 (FD)	RM2 (RD)	URM
Basic Score	**4.4**	**3.8**	**2.8**	**3.0**	**3.2**	**2.8**	**2.0**	**2.5**	**2.8**	**1.6**	**2.6**	**2.4**	**2.8**	**2.8**	**1.8**
Mid Rise (4 to 7 stories)	N/A	N/A	+0.2	+0.4	N/A	+0.4	+0.4	+0.4	+0.4	+0.2	N/A	+0.2	+0.4	+0.4	0.0
High Rise (> 7 stories)	N/A	N/A	+0.6	+0.8	N/A	+0.8	+0.8	+0.6	+0.8	+0.3	N/A	+0.4	N/A	+0.6	N/A
Vertical Irregularity	-2.5	-2.0	-1.0	-1.5	N/A	-1.0	-1.0	-1.5	-1.0	-1.0	N/A	-1.0	-1.0	-1.0	-1.0
Plan irregularity	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Pre-Code	0.0	-1.0	-1.0	-0.8	-0.6	-0.8	-0.2	-1.2	-1.0	-0.2	-0.8	-0.8	-1.0	-0.8	-0.2
Post-Benchmark	+2.4	+2.4	+1.4	+1.4	N/A	+1.6	N/A	+1.4	+2.4	N/A	+2.4	N/A	+2.8	+2.6	N/A
Soil Type C	0.0	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Soil Type D	0.0	-0.8	-0.6	-0.6	-0.6	-0.6	-0.4	-0.6	-0.6	-0.4	-0.6	-0.6	-0.6	-0.6	-0.6
Soil Type E	0.0	-0.8	-1.2	-1.2	-1.0	-1.2	-0.8	-1.2	-0.8	-0.8	-0.4	-1.2	-0.4	-0.6	-0.8


Rapid Visual Screening of Buildings for Potential Seismic Hazards
FEMA-154 Data Collection Form
HIGH Seismicity

Address:
Zip
Other Identifiers
No. Stories
Year Built
Screener
Date
Total Floor Area (sq. ft.)
Building Name
Use

PHOTOGRAPH

Scale:

OCCUPANCY | SOIL | TYPE | FALLING HAZARDS

BASIC SCORE, MODIFIERS, AND FINAL SCORE, S

FINAL SCORE, S

COMMENTS

Detailed Evaluation Required
YES NO

Figure 3-13. Portion of Data Collection Form containing attributes that modify performance and associated score modifiers.

3.8 Identifying Seismic Performance Attributes and Recording Score Modifiers

This section discusses major factors that significantly impact structural performance during earthquakes, and the assignment of Score Modifiers related to each of these factors (attributes). The severity of the impact on structural performance varies with the type of lateral-force-resisting system; thus the assigned Score Modifiers depend on building type. Score Modifiers associated with each performance attribute are indicated in the scoring matrix on the Data Collection Form (see Figure 3-13). Score Modifiers for the building being screened are circled in the appropriate column (i.e., under the reference code for the identified lateral-force-resisting system for that building).

Following are descriptions of each performance attribute, along with guidance on how to recognize each from the street. If a performance attribute does not apply to a given building type, the Score Modifier is indicated with “N/A”, which indicates “not applicable.”

3.8.1 Mid-Rise Buildings

If the building has 4 to 7 stories, it is considered a mid-rise building, and the score modifier associated with this attribute should be circled.

3.8.2 High-Rise Buildings

If the building has 8 or more stories, it is considered a high-rise building, and the score modifier associated with this attribute should be circled.

3.8.3 Vertical Irregularity

This performance attribute applies to all building types. Examples of vertical irregularity include buildings with setbacks, hillside buildings, and buildings with soft stories (see illustrations of example vertical irregularities in Figure 3-14).

If the building is irregularly shaped in elevation, or if some walls are not vertical, then apply the modifier (see example in Figure 3-15).

If the building is on a steep hill so that over the up-slope dimension of the building the hill rises at least one story height, a problem may exist because the horizontal stiffness along the lower side may be different from the uphill side. In addition, in the up-slope direction, the stiff short columns attract the seismic shear forces and may fail. In this case the performance modifier is applicable. See Figure 3-14 for an example.

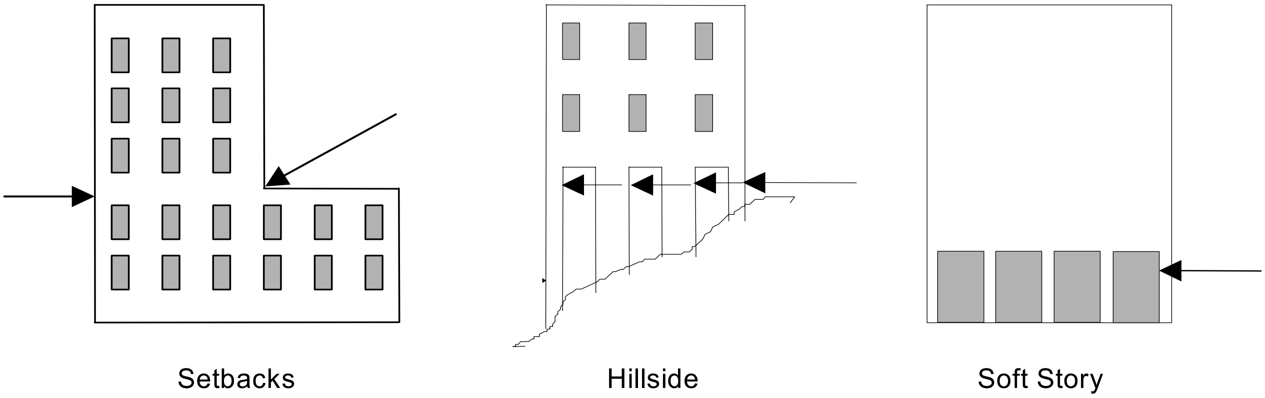


Figure 3-14 Elevation views showing vertical irregularities, with arrows indicating locations of particular concern.

A soft story exists if the stiffness of one story is dramatically less than that of most of the others (see Figure 3-15). Examples are shear walls or infill walls not continuous to the foundation. Soft stories are difficult to verify without knowledge of how the building was designed and how the lateral forces are to be transferred from story to story. In other words, there may be shear walls in the building that are not visible from the street. However, if there is doubt, it is best to be conservative and indicate the existence of a soft story by circling the vertical irregularity Score Modifier. Use an asterisk and the comment section to explain the source of uncertainty. In many commercial buildings, the first story is soft due to large window openings for display purposes. If one story is particularly tall or has windows on all sides, and if the stories above have fewer windows, then it is probably a soft story.

A building may be adequate in one direction but be "soft" in the perpendicular direction. For example, the front and back walls may be open but the side walls may be solid. Another common example of soft story is "tuck under" parking commonly found in apartment buildings (see Figure 3-16). Several past earthquakes in California have shown the vulnerability of this type of construction.

Vertical irregularity is a difficult characteristic to define, and considerable judgment and experience are required for identification purposes.

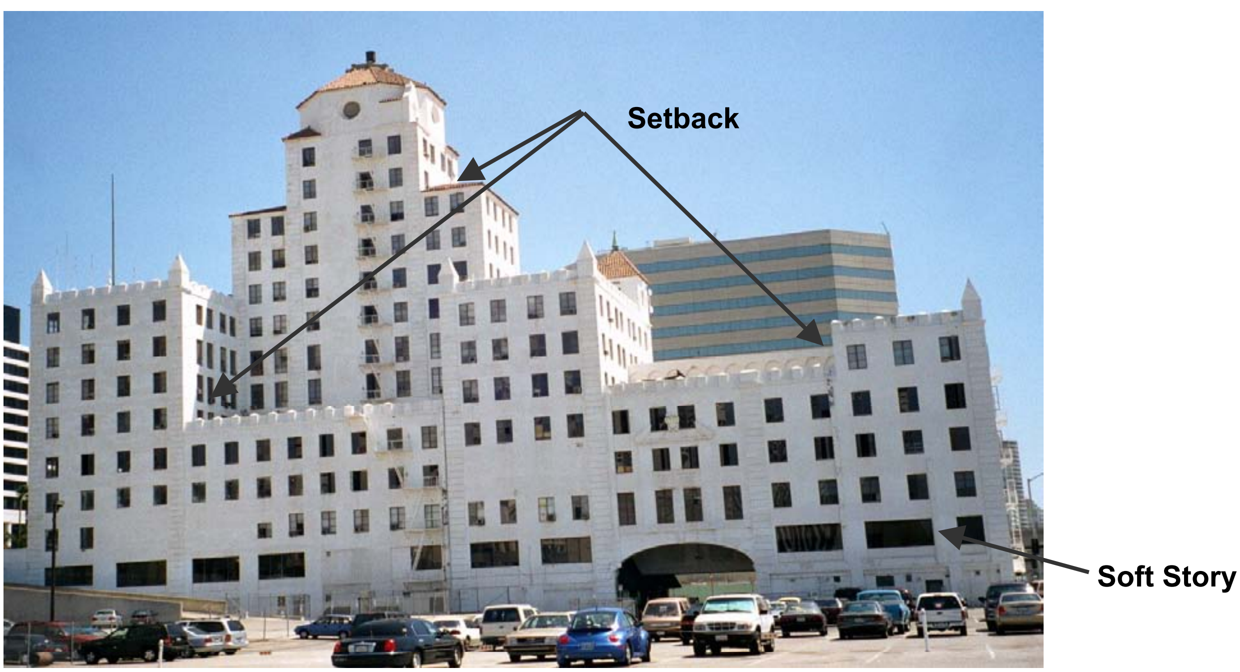


Figure 3-15 Example of setbacks (see Figure 3-14) and a soft first story.

Figure 3-16 Example of soft story conditions, where parking requirements result in large weak openings.

3.8.4 Plan Irregularity

If a building has a vertical or plan irregularity, as described below, this modifier applies. Plan irregularity can affect all building types. Examples of plan irregularity include buildings with re-entrant corners, where damage is likely to occur; buildings with good lateral-load resistance in one direction but not in the other; and buildings with major stiffness eccentricities in the lateral-force-resisting system, which may cause twisting (torsion) around a vertical axis.

Buildings with re-entrant corners include those with long wings that are E, L, T, U, or + shaped (see Figures 3-17 and 3-18). See SEAOC (1996) for further discussion of this issue.)

Plan irregularities causing torsion are especially prevalent among corner buildings, in which the two adjacent street sides of the building are largely windowed and open, whereas the other two sides are generally solid. Wedge-shaped buildings, triangular in plan, on corners of streets not meeting at 90°, are similarly susceptible (see Figure 3-19).

Although plan irregularity can occur in all building types, primary concern lies with wood, tilt-up, pre-cast frame, reinforced masonry and unreinforced masonry construction. Damage at connections may significantly reduce the capacity of a vertical-load-carrying element, leading to partial or total collapse.

3.8.5 Pre-Code

This Score Modifier applies for buildings in high and moderate seismicity regions and is applicable if the building being screened was designed and constructed prior to the initial adoption and enforcement of seismic codes applicable for that building type (e.g., steel moment frame, S1). The year(s) in which seismic codes were initially adopted and enforced for the various model building types should have been identified as part

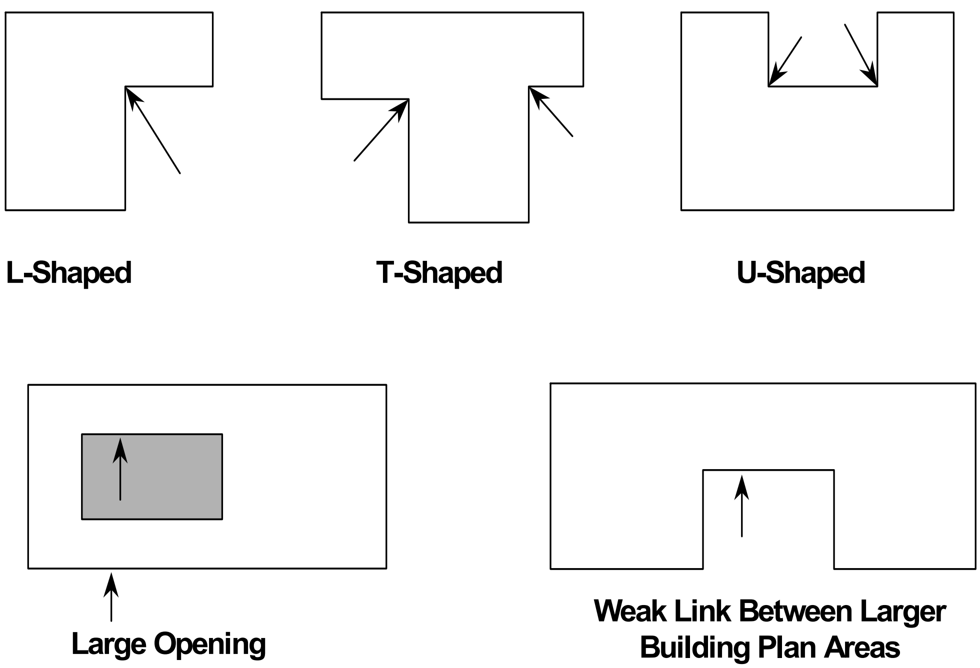


Figure 3-17 Plan views of various building configurations showing plan irregularities; arrows indicate possible areas of damage.

Figure 3-18 Example of a building, with a plan irregularity, with two wings meeting at right angles.

Figure 3-19 Example of a building, triangular in plan, subject to torsion.

of the Data Collection Form review process during the pre-planning stage (as recommended in Section 2.4.2). If this determination was not made during the planning stage, the default year is 1941, for all building types except PC1, in which case it is 1973. Because of the method used to calculate the Basic Structural Hazard Scores, this modifier does not apply to buildings in the low seismicity region.

3.8.6 *Post-Benchmark*

This Score Modifier is applicable if the building being screened was designed and constructed after significantly improved seismic codes applicable for that building type (e.g., concrete moment frame, C1) were adopted and enforced by the local jurisdiction. The year in which such improvements were adopted is termed the "benchmark" year. Benchmark year(s) for the various model building types should have been identified as part of the Data Collection Form review process during the pre-planning stage (as recommended in Section 2.4.2). Benchmark years for the various building types (designed in accordance with various model codes) are provided in Table 2-2.

3.8.7 *Soil Type C, D, or E*

Score Modifiers are provided for Soil Type C, Type D, and Type E. The appropriate modifier should be circled if one of these soil types exists at the site (see Section 3.4 for additional discussion regarding the determination of soil type). If sufficient guidance or data are not available during the planning stage to classify the soil type as A through E, a soil type E should be assumed. However, for one- or two-story buildings with a roof height equal to or less than 25 feet, a class D soil type may be assumed if the actual site conditions are not known.

There is no Score Modifier for Type F soil because buildings on soil type F cannot be screened effectively by the RVS procedure. A geotechnical engineer is required to confirm the soil type F and an experienced professional engineer is required for building evaluation.

3.9 Determining the Final Score

The Final Structural Score, *S*, is determined for a given building by adding (or subtracting) the Score Modifiers for that building to the Basic Structural Hazard Score for the building. The result is documented in the section of the form entitled Final Score (see Figure 3-20). Based on this information, and the "cut-off" score selected during the pre-planning process (see Section 2.4.3), the screener then decides if a detailed evaluation is required for the building and circles "YES" or "NO" in the lower right-hand box (see Figure 3-20). Additional guidance on this issue is provided in Sections 4.1, and 4.2.

When the screener is uncertain of the building type, an attempt should be made to eliminate all unlikely building types. If the screener is still left with several choices, computation of the Final Structural Score *S* may be treated several ways:

1. The screener may calculate *S* for all the remaining options and choose the lowest

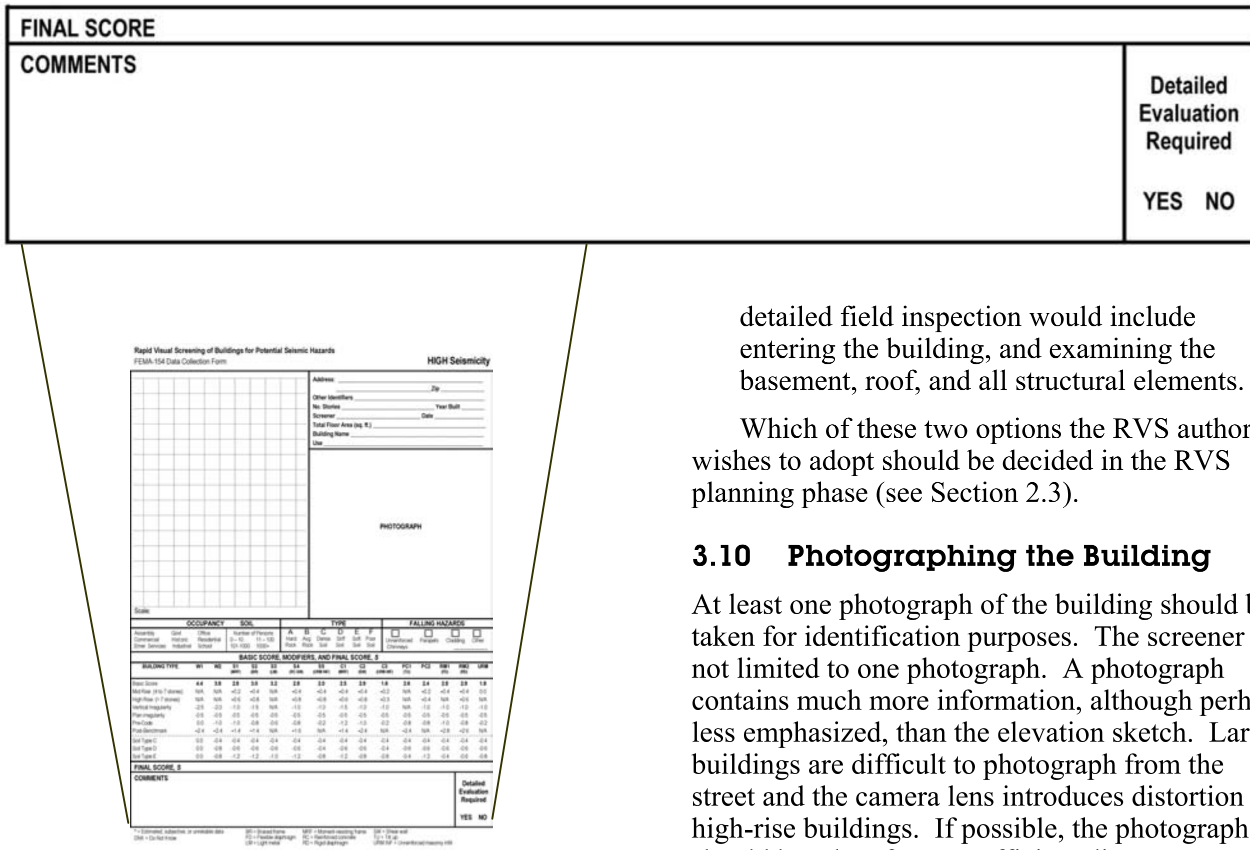


Figure 3-20 Location on Data Collection Form where the final score, comments, and an indication if the building needs detailed evaluation are documented.

score. This is a conservative approach, and has the disadvantage that it may be too conservative and the assigned score may indicate that the building presents a greater risk than it actually does. This conservative approach will not pose problems in cases where all the possible remaining building types result in scores below the cut-off value. In all these cases the building has characteristics that justify further review anyway by a design professional experienced in seismic design.

2. If the screener has little or no confidence about any choice for the structural system, the screener should write DNK below the word "Building Type" (see Figure 3-7), which indicates the screener does not know. In this case there should be an automatic default to the need for a detailed review of the building by an experienced design professional. A more detailed field inspection would include entering the building, and examining the basement, roof, and all structural elements.

Which of these two options the RVS authority wishes to adopt should be decided in the RVS planning phase (see Section 2.3).

3.10 Photographing the Building

At least one photograph of the building should be taken for identification purposes. The screener is not limited to one photograph. A photograph contains much more information, although perhaps less emphasized, than the elevation sketch. Large buildings are difficult to photograph from the street and the camera lens introduces distortion for high-rise buildings. If possible, the photograph should be taken from a sufficient distance to include the whole building, and such that adjacent faces are included. A wide angle or a zoom lens may be helpful. Strong sunlit facades should be avoided, as harsh contrasts between shadows and sunlit portions of the facade will be introduced. Lastly, if possible, the front of the building should not be obscured by trees, vehicles or other objects, as they obscure the lower (and often the most important) stories.

3.11 Comments Section

This last section of the form (see Figure 3-20) is for recording any comments the screener may wish to make regarding the building, occupancy, condition, quality of the data or unusual circumstances of any type. For example, if not all significant details can be effectively photographed or drawn, the screener could describe additional important information in the comments area. Comments may be made on the strength of mortar used in a masonry wall, or building features that can be seen at or through window openings. Other examples where comments are helpful are described throughout Chapter 3.